AMERICAN RAILROAD JOURNAL, AND MECHANICS' MAGAZINE.

Published Monthly at 23 Chambers-st. New York, at $2 a-year, in advance, or 3 copies for $5. } D. K. MINOR, Editor.

No. 7, Vol. 2. Third Series. } JULY, 1844. } Whole No. 438. Vol. XVII.

REMARKS ON THE PROFESSION

In this number we devote a little space to some remarks on the present state and prospects of the profession. Some years since we entered into this question at length, and ascribed the failure of many works to the fact that they were mere political jobs, projected by persons whose education, habits and pursuits rendered them incapable of forming any idea of the grand outline of the most efficient work to accomplish the objects aimed at, and who very naturally selected kindred spirits to execute their crude designs. Whether we then ascribed too much to this cause, and whether all the canals and railways of this country would have been as much better executed by private enterprize, as we then argued, is left to the judgment of the intelligent and candid reader.

The importance of extending the sphere of usefulness of the profession, has been repeatedly alluded to by ourselves, and correspondents, and unless this be done, a large portion of those who still cling to the hope of employment cannot too soon give up all idea of engineering as a means of support. The works we more especially allude to are roads, bridges, docks, dams and the *general* arrangement of the buildings and power of large manufacturing establishments. Still with every exertion, time will be required, and some years must elapse before the community will discover that the advice and assistance of an experienced engineer may be useful to them in other works than canals and railways. Indeed some of our railways even are entrusted to persons suddenly taken from other pursuits, and the repairs of superstructure, bridges, engines, etc., are left to the discretion of the subordinate hands. Such persons are unable to enter into the details which form the amount of annual expenses, and, though quite competent to strike the balance of profit and loss, are unable to show where the main difficulties lie, far less to suggest any mode of remedying the evil. Without going so far as to attribute the failure of some works to this cause, we feel confident that we may safely ascribe to it the smallness of some dividends, in part at least.

We believe also that the higher walks of the profession have been neglected. The engineer has only too often to execute the designs of some

board, without a voice in the general plan; and it is hard to say whether the interests of the stockholders or of the profession suffer most from this cause. It must have struck all familiar with the general mode of proceeding in England, that the opinion of the engineer of the work is either closely adhered to, or at least forms the basis of discression among the directors; in many instances the opinions of numerous other engineers are taken also, not merely with reference to some mechanical detail, but as to location and general plan of the work. Now it is very easy to make preliminary surveys and reports in which all appears very smooth until submitted to the stern tests of construction and active operation. Then is seen by all with what degree of judgment the work has been adapted to its objects, both as regards the general plan and mechanical details. Then the cost, capabilities and income necessarily indicate the degree of judgment evinced in projection and execution, and that which, when the first line was traced, was a mystery to all or nearly all, becomes notorious to the casual observer. But the highest aim of the engineer is to determine, *a priori*, within reasonable limits, what the effect of any projected undertaking will be, and to take measures accordingly. This, however, requires something more than the use of the level and goniometer. It requires a thorough acquaintance with the wants of the community, as far as they are likely to be affected by the contemplated undertaking, as well as a knowledge of the various engineering means by which these wants may be best satisfied. Such information is obtained with no little labor, and to sift the mass of evidence in all such investigations, and to lay down the "projet" of the work by which these new facilities can be afforded with the least outlay, and in the best manner, is a problem to be mastered only by the union of character and liberal acquirements with the mechanical skill which forms the basis of the profession, and which is regarded by only too many as the sole requisite.

For example, suppose the enlargement of the Erie canal, the construction of the Chenango, Black river and Genessee valley canals had been submitted to such men as Brunel, Rennie, Stephenson, etc., does any one doubt that they would have condemned them? We name foreign engineers for obvious reasons, and not because we are without men whose verdict would have been equally just and decided. Indeed it is not long since the failure of the Reading railway and of the canals of Canada were predicted by two of our contributors, who went into elaborate investigations in support of their views, with what reason time will very soon show. But what we desire is to see these thorough examinations gone into before the work is commenced —nay, more, before the general plan of operations has been decided on. If this be done, we shall meet with no failures, though all that was anticipated may not be realized.

But, as already remarked, this can only be done by men of enlarged views who can take in at once the nature and extent of the engineering accommodation required, and the probability of these accommodations yielding an income sufficient to warrant their being carried into execution. And this is

not all: when the result is not favorable in the opinion of the engineer, he must report decidedly against it. Unless this be done, the profession must suffer; for, in that case, the highest engineering considerations are thrown on the directors and stockholders, who, though the proper judges of the various plans submitted, are by no means the most suitable persons to project original designs. Yet the leading features of the State works of New York were left to commissioners, men appointed with reference to their politics, and the taxes levied to meet the debts of the canals attest their capacity, in one way at least, that of running up a large debt in a very short time.

It is, however, of little consequence that the engineers have an influence in these questions, if they know nothing beyond the field work, and we have heard experienced and educated engineers complain that the younger members of the profession, who were well versed in the practice, did so little to acquire that information which is indispensable to every one who aspires to succeed in the execution of great works—we do not mean the mere expenditure of large sums. In looking over the pages of this *Journal* and that of the Franklin Institute, for the last ten years, we find a large portion of the contributions from the same writers; and although we are far from intimating that all who can contribute have done so, it must still be allowed that these Journals give some tolerable idea of the practical, scientific and even literary attainments of the profession in the United States. The objects attained by the meetings of the Institute of Civil Engineers in London must be reached here by other means, which have been well pointed out by Mr. Latrobe in the *Journal.* We are even inclined to think that the plan there proposed, that of each and every member contributing his mite to some Journal taken by all, promises more important results than could be expected from any society in so extensive a country as this.

Impressed with these views, we beg leave to remind our readers of Mr. Latrobe's suggestion, more especially that part in which he alludes to those who, seldom writing, are averse to appearing in print because they fear their style may be inferior to the matter of their productions. Now the style—provided it be tolerably clear—is of exceedingly little importance, and we will venture to say that any striking improvement or original suggestion in any of the mechanical arts connected with engineering, will be immediately seized on and appreciated by the educated engineer, be the language ever so crude. More than this, it will be found that the most accomplished members of the profession will be the very last to regard the mere style of a contribution of a practical man on a practical subject.

In this number we conclude the explanation of the very extensive tables of excavation and embankment already published, and remain as ever desirous of making our columns the medium of conveying as much practical and definite engineering information as possible. Now it appears to us that this might be easily accomplished if engineers in different parts of the country would contribute their views on various points, not in elaborate essays, but in "Notes," as leisure or inclination may permit. This mode of com-

municating is attended with this advantage, that many minor but still important subjects which are not considered sufficient for a formal paper, may be easily treated in the familiar form of "Notes." We know that the gentleman to whom we are indebted for the "Notes on Practical Engineering," is not without hopes that others will also give their views on those points to which they have devoted particular attention, or in treating which they differ from the ordinary course.

There appears to be at this time a probability that public works will soon be extensively undertaken, and their steady continuance would be certain if engineers generally would decidedly report against all extravagant and injudicious projects which sink the money of the stockholder, ruin his confidence in the profession, and, of course, destroy the prospects of the engineer: in one word—character, united with skill, are required to give the profession anything like the standing and influence it has in England, the results of which the world is familiar with.

We should have remarked above that Smeaton and Telford, both self-made men, as well as all the first engineers in England at the present day, have written much and well. Brindley is an exception, and a most dangerous precedent for any man not gifted with his extraordinary natural abilities. The habit of writing leads to very close investigations, and necessarily induces habits of exactness and accuracy, than which nothing is more important to the engineer; and we close these remarks, which have grown upon our hands, with observing that, in our widely extended country, a general habit on the part of engineers of contributing papers, notes or memoranda on various appropriate topics, offers the best—certainly the surest mode of raising the standard of the profession, as well as of rendering it more useful and honorable to the country and to its members.

CANADIAN WORKS.

It appears that £300,000 of the Canadian loan, the interest of which—4 per cent.—is guaranteed by the British government, has been taken at 112. We regret exceedingly that no portion of the loan has been devoted to railways, cheaply constructed and adapted to the immediate wants of the community, instead of being nearly all laid out on canals, which *may* be required some century hence at soonest. The following extract is from a late Montreal paper. It appears that these—as we believe—most unfortunate undertakings are as fruitful of immediate suffering and disgrace as of permanent injury to the country; for the tide of emigration is not more rapidly turned by the cholera itself than by taxation. The land was taken about two years since!

"By letter in the *Melanges Religieux,* we see that the farmers along the line of the Beauharnois canal are all complaining of delay in receiving payment of the indemnity due to them for land taken up by the canal, as well as for damage done to their property, and even for labor performed as far back as last season. This is not right."

EXPLANATION AND ARRANGEMENT OF THE TABLES.

Tables I to XXI, with exception of tables VII, XIV and XXI, are contents for average depths, bases 15, 18, 25, 28, 30 and 34 feet for each of the side slopes ½ to 1, 1 to 1 and 1½ to 1.

Tables VII, XIV and XXI, are corrections for differences of depths for the same slopes.

Table XXII, contents of prisms with square bases.

These tables are all calculated for a length of 100 feet, the depths being supposed given in feet, and the contents are expressed in cubic yards.

The remainder of the tables, XXIII, XXIV, XXV and XXVI, are greater and lesser areas, horizontal and side distances for the side slopes ½ to 1, 1 to 1, 1½ to 1 and 2 to 1. Column first contains the inclination of the surface of the ground in degrees. The second and fourth columns, marked A and *a*, contain the greater and lesser areas A L E, E D M, (fig. 1) when E I or H is one. The sixth column, marked (A — *a*), contains the difference between the second and fourth, to be used when the degree of inclination is the same on both sides of the centre line of the road. When the inclination is not the same on both sides, the areas must be taken out separately for each side, and afterwards subtracted. The third, fifth and seventh columns are half the difference of the numbers in the preceding columns. The other columns in these tables are the greater and lesser horizontal and side distances, arranged in a similar manner to the columns of areas.

The greater areas, horizontal and side distances, are used when these dimensions rise above the centre line of an excavation, and the lesser areas, horizontal and side distances, when below the centre. In embankment the reverse obtains. The prism, of which the greater area is the base, must always be added to the content in excavation or embankment, and the prism, of which the lesser area is the base, must always be subtracted.

EXAMPLES, SHOWING THE MANNER OF USING THE TABLES.

First. Cases where the natural surface is level transversely.

EXAMPLE 1. A cut, the base of which is 25 feet, side slope 1½ to 1, depth 10·5 feet throughout, is 100 feet in length, required the content.

Turn to table XVII, and opposite 10 feet, and under ·5, will be found the required content: 1585 cubic yards.

EXAMPLE 2. An excavation, having the same base and side slope, is 19 feet deep at one end, 2 feet at the other, and 100 feet in length, the content is required.

The average depth (or ½ sum of the depths at the ends) is 10·5 feet, and the difference of the depths is 17.

The content for a depth of 10·5 feet is . .	1585 cub. yds.
And the correction for a difference of 17 feet is found in table XXI, ...	134 "
Hence the true content is	1719 "

When the length is not 100 feet, multiply the result obtained from the tables by the given length, and divide by 100 for the true content.

EXAMPLE 3. A cut, the base of which is 15 feet, side slope ½ to 1, and length 300 feet, is 10 feet deep throughout, required the content.

The content for a depth of 10 feet and length 100 feet is found by table I to be 741 cubic yards.

$$\text{Hence, } \frac{741 \times 300}{100} = 2223 \text{ cubic yards.}$$

It will be observed that when the excavation or embankment runs to nothing at one end, the same method is applicable; ½ the depth at the other end being the average, and the depth itself being the difference of depths.

EXAMPLE 4. An embankment is 25 feet wide on top, has a side slope of 1½ to 1, is 6 feet deep at one end, and runs out in a length of 30 feet, required the content.

The content for the average depth, 3 feet, is, by table XVII,	328 c. yds.
The correction for difference of 6 feet, is, by table XXI,	17 "
The content for a length of 100 feet is,	345 "

$$\text{Hence, } \frac{345 \times 30}{100} = 103{\cdot}5 \text{ cubic yards.}$$

When there is excavation at one station and embankment at the succeeding one, the length of excavation will be found by multiplying the depth of excavation by the whole distance between the stations, and dividing by the sum of the depths of excavation and embankment.

EXAMPLE 5. Let there be 7 feet depth of excavation at one station, and 3 feet embankment at another, 100 feet distant from the former.

$$\text{Then, } \frac{7 + 100}{7 \times 33} = 70 \text{ feet length of excavation,}$$

$$\text{and } 100 - 70 = 30 \text{ feet length of embankment.}$$

Hence the content of each can be found as in 4th example. When the base is different from that for which any of the tables are calculated, the content can be found by equation (Y), in which it will be observed that H and H′ are the sums of the depths and $\frac{1}{2\,m}$th the base. Find the number in table XXII, for prisms 100 feet in length, corresponding to square bases whose sides are $\frac{H + H'}{2}$, $H - H'$ and $\frac{B}{2\,m}$ respectively. Then from the sum of the first and $\frac{1}{12}$ the second subtract the third, and multiply the remainder by the slope (m) for the content of a length of 100 feet.

As we have already explained the mode of proceeding when the length is not 100 feet, it is unnecessary to introduce instances of uneven distances,

and in the following examples, the length of excavation and embankment must be considered always 100 feet, unless some other distance is specified.

EXAMPLE 6. In an excavation the base is 14 feet, slope 1 to 1, and depths at the ends 10 and 2 feet.

Here $H = 17$, $H' = 9$, $\frac{H + H'}{2} = 13$, $H - H' = 8$, $m = 1$ and $\frac{B}{2m} = 7$.

$\frac{H + H'}{2} = 13$ corresponding number for table XXII,				626 cub. yds.
$H - H' = 8$	"	"	table XIV,	20 "
				646 cub. yds.
$\frac{B}{2m} = 7$,	"	"	"	181 cub. yds.
Content,	.	.	.	465 cub. yds.

When it is only required to ascertain the whole content of an excavation or embankment, and the stations have been taken at uniform distances from each other, the labor of the calculation may be somewhat abridged by the adoption of the mode pursued in the next example.

EXAMPLE 7. Let the base of an excavation be 40 feet in width, the side slopes 2 to 1, and the depths of cut at intervals of 100 feet, as stated in the left hand column of the following table; required the content of the excavation.

Depth in feet.	H + H'* in feet.	Cor. No. from table xxii c. y.	H — H' in feet.	Cor. number table xiv c. y.
0·0				
2·0	42·0	6533	2·0	1
3·6	45·6	7701	1·6	0
8·9	52·5	10208	5·3	9
12·4	61·3	13917	3·5	4
14·0	66·4	16329	1·6	1
9·0	63·0	14700	5·0	8
6·0	55·0	11204	3·0	3
4·2	50·2	9333	1·8	1
2·1	46·3	7940	2·1	1
0·0	42·1	6564	2·1	1
		4)104,429		29
		26,107		
		29		

26,136 ; now $\frac{B}{2m} = 10$ cor. No. tab. 370;

hence, $\frac{370 \times L\ (=1000)}{100} = 3700$

22426

Hence $6725 \times m\ (= 2) = 44{,}872$ cubic yards is the total content of the excavation.

NOTE. Double the depth gives four times the content.

Second. Cases where the natural surface of the ground has an inclination at right angles to the line of the road.

EXAMPLE 8. An excavation, the base of which is 28 feet, side slope 1 to 1, and depth throughout 10 feet, has a transverse slope right and left of 12°; required the content.

First Method. Here (area $a\ l$ E — area E $d\ m$) for 12° in table XXIV is ·0473, and $\left(10+\frac{B}{2\,m}\right)^2 L = (24)^2 \frac{100}{27} = H^2 L$ in table XXII is 2133 cubic yards.

Consequently	2133 c. yds.
	3740 "
multiplied by ·0473	853 "
	149 "
	6 "
gives the correction	100·8 c. yds.
which added to average content from table XI .	1407·0 "
makes the total content	1507·8 c. yds.

Second Method, (by equation X). Here,

$$H^2 (Y + y) \frac{L}{2} - \frac{B^2 L}{4\,m} \text{ equal the content.}$$

$H^2 \times L = (24)^2 \times \frac{100}{27}$ is found in table XXII opposite 24,	2133 c. yds.
	3740·1 "
$\frac{1}{2}(Y + y)$ in table XXIV is $\frac{2{\cdot}0946}{2} = 1{\cdot}0473$	2133·0 "
	85·3 "
	14·9 "
	·6 "
	2233·8 "
Subtract $\frac{B^2 L}{4\,m}$ (table XXII) . . .	726·0 "
and we have for the true content as before	1507·8 "

EXAMPLE 9. An embankment, 25 feet wide on top, having a side slope of $1\frac{1}{2}$ to 1, is 12 feet deep at one end and 4 at the other, and has a transverse slope right and left of the centre at both ends of 12°; required the content.

First Method, (by formula N)

$$\left\{ H^2 + H'^2 + (H + H')^2 \right\} (A - a) \frac{L}{6} = \text{correction for transverse slope.}$$

$H^2 \times L = (20{\cdot}3)^2 \frac{100}{27}$ = No. cor. to 20·3 in tab. XXII is	1526 c. yds.
$H'^2 \times L = (12{\cdot}3)^2 \frac{100}{27}$ = " 12·3 " "	560 "
$(H + H')^2 \times L = (20{\cdot}3 + 12{\cdot}3)^2 \frac{100}{27}$ No. cor. to 32·7 "	3960 "
	6046 "

$\frac{1}{6}$ area (A — a) for 12° in table XXV col. 6 is $\frac{\cdot 1698}{6} = \cdot 0283$, 3820 c. yds.

	1209	"
	484	"
	18	"
Therefore the correction for transverse slope is	171·1	c. yds.
Content for average depth 8 feet in table XVII,	1096·	"
Correction for difference " " XXI,	30	"
Total content,	1297·	"

We might have found the above correction for transverse slope by adding the value of equation (O) to the correction for a uniform depth $\frac{H + H'}{2} =$ 16·3.

$$(H - H')^2 (A - a) \frac{L}{12} = \frac{8^2}{12} \times \frac{100}{27} \times \cdot 1698 = 3 \text{ cubic yards.}$$

We see that in this case it would have been sufficiently accurate for all practical purposes in obtaining the correction for transverse slopes to have supposed the depth uniform throughout.

The following table shows the difference of depths answering to given values of A — a when the value of equation (O) becomes 10 cubic yards.

A — a	H — H′	A — a	H — H′	A — a	H — H′
·1	18·0	·6	7·4	1·1	5·4
·2	12·6	·7	6·8	1·2	5·2
·3	10·4	·8	6·4	1·3	5·0
·4	9·0	·9	6·0	1·4	4·8
·5	8·1	1·0	5·7	1·5	4·6

By comparing the values of A — a above given with the difference of areas as exhibited in tables XXIII, XXIV, XXV and XXVI, it will be seen that there will but few cases occur where equation (O) need be considered.

Second Method, by equation (V),

$$\left\{ H^2 + H'^2 + (H + H')^2 \right\} (Y + y) \frac{L}{12} - \frac{B^2 L}{4m} = \text{content},$$

$\left\{ H + H'^2 + (H + H')^2 \right\}$ L as before, 6046 c. yds.

	3872	"
$\frac{1}{12}$ (Y + y), (table XXV, column 12), $\frac{3 \cdot 3397}{12} = \cdot 2783$	12092	
	4232	
	484	
	18	
	1683·	"
Deduct $\frac{B^2 L}{4m}$, - - - -	386·	"
And there remains the content of embankment, the same as before.	1297·	"

EXAMPLE 10. The transverse slopes and depths at the two extremities of an excavation, the base of which is 28 feet, and the side slope 1 to 1, are as represented in the following statement; required the content.

Depth at centre.	Slope to right.	Slope to left.
14 feet	$+12°$	$-6°$
6 "	$+4°$	$-9°$

The sign + prefixed to the right slope indicates that the ground is higher on the right of the centre, and the sign — before the left slope, shows that the natural surface falls from the centre on the left.

Examples of this kind will be solved most conveniently by equations (S) and (T). Here we have

$$\left\{ H^2 + H'^2 + (H + H')^2 \right\} (Y + y + Y' + y') \frac{L}{24} - \frac{B^2 L}{4\,m} = \text{content},$$

$$\text{and } (H^2 - H'^2)(Y + y - Y' - y') \frac{L}{12} = \text{correction}.$$

From table XXIV we have

Y for $12°$	1·2699	and Y' for $4°$	1·0752
y for $6°$	·9049	y' for $9°$	8633
$Y + y$	2·1748	$Y' + y'$	1·9385
	1·9385		2·1748
	24)4·1133		12) ·2363
$\frac{1}{24}(Y + y + Y' + y') =$	·1714	$\frac{1}{12}(Y + y - Y' - y') =$	·0197

$H^2 \times L = (28)^2 \times \frac{100}{27}$, (table XXII), - - 2904 c. yds.

$H'^2 \times L = (20)^2 \times \frac{100}{27}$ " - - - 1481 "

$(H + H')^2 \times L = (48)^2 \times \frac{100}{27}$ " - - 8533 "

12918

Multiplied by $\frac{1}{24}(Y + y + Y' + y') = ·1714$, - - 4171

12918
9043
129
52

And we have for content, - - - - 2214 c. yds.

$(H^2 - H'^2)\,L$ - - - 1423 c. yds.

7910

Multiplied by $\frac{1}{12}(Y + y - Y' - y') = ·0197$, 142

128
10

28· c. yds.

2242· "

Subtract $\frac{B^2 L}{4\,m} = \left(\frac{28}{2\,m}\right)^2 L\,m$ - - 726 "

And we have for the true content, - - - 1516· "

Another Method, by equations (L) and (M).

$$\left\{ H^2 + H'^2 + (H + H')^2 \right\} (A - a + A' - a) \frac{L}{12} = \text{1st correction.}$$

$$(H^2 - H'^2) \left\{ (A - a) - (A' - a) \right\} \frac{L}{6} = \text{2d correction.}$$

From table XXIV we get,

under A and opposite	12°	·1350	and under A′ and opposite	4°	·0376
" a "	6°	·0476	" a' "	9°	·0684
A — a		+ ·0874	A′ — a'		— ·0308
		— ·0308			+ ·0874
	12)	+ ·0566		6)	+ ·1182
$\frac{1}{12}$ (A — a + A′ — a')		·0047	$\frac{1}{6} \{(A - a) - (A' - a')\}$		·0197

$\left\{ H^2 + H'^2 + (H + H')^2 \right\}$ L as before, - 12918 c. yds.
7400

multiplied by $\frac{1}{12}$ (A — a + A′ — a') = ·0047 517
90

gives us for the 1st correction, - - 61 c. yds.

and ($H^2 - H'^2$) L - - 1423 c. yds.
7910

multiplied by $\frac{1}{6} \left\{ (A - a) - (A' - a') \right\}$ = ·0197 142
128
10

gives us the 2d correction, - -	28 c. yds.
Content for average depth 10 feet (table XI), - -	1407 "
Correction for difference of depths 8 feet (table XIV), -	20 "
Total content, - - - -	1516 "

EXAMPLE 11. The base of an excavation is 18 feet wide, side slopes 1 to 1, and depth at centre 8· feet, depth at right slope 13· ft., depth at left slope 4· ft.,
" " " 21· " " " " 30· " " " 14· ft;
required the content.

First Method, by equation (E).

Here, $H = 17$, $H' = 30$, $P = 5$, $p = 4$ $P' = 9$ and $p' = 7$.

Hence, $\left\{ (2\,H + H')(P - p) + (H + 2\,H')(P' - p') \right\} \frac{m\,L}{12} = 67$ c. yds.

Content for average depth 14·5 feet (table IX) = -	1745 "
Correction for difference of depths 13· feet (table XIV) =	52 "
Total content, - - - -	1864 "

Or by equations (F) and (G),

$(H + H')(P - p + P' - p') \frac{m\,L}{8}$ = 1st cor. transverse slope = 65 c. yds.

$(H - H') \left\{ (P - p) - (P' - p') \right\} \frac{m\,L}{24}$ = 2d " " " 2 "

Total correction for transverse slope same as before, 67 "

Here we might have omitted the 2d correction for transverse slope, as it only amounted to two cubic yards.

Second Method, by equation (R).

Here, $H = 17$, $H' = 30$, $W = 22$, $w = 13$, $W' = 39$ and $w' = 23$.

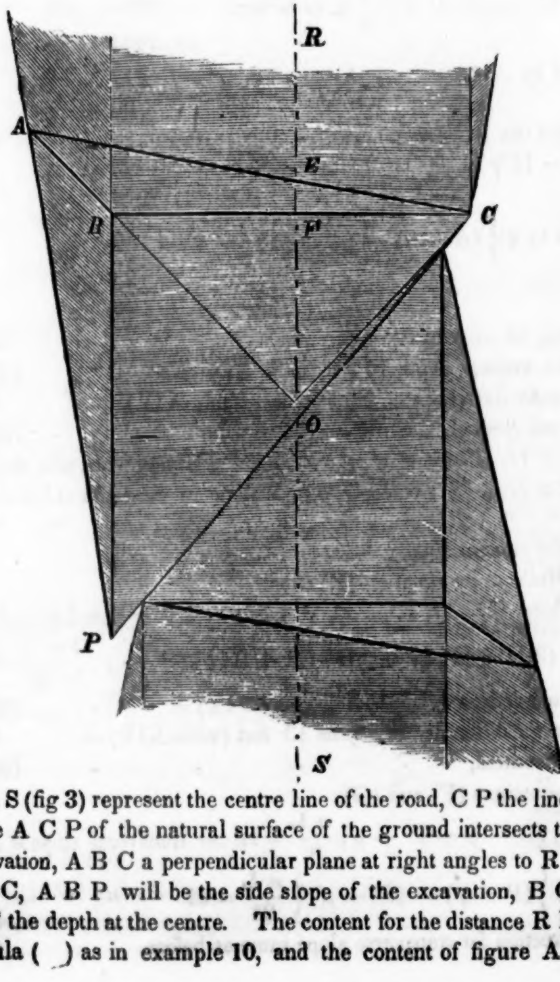
Hence, $\left\{ (2\,H + H')(W + w) + (H + 2\,H')(W' + w') \right\} \frac{L}{12} = 2164$ c. y.

Deduct $\frac{B^2\,L}{4\,m} =$ - - - - 300 c. y.

And we have as before, - - - - 1864 c. y.

When the work changes from excavation to embankment in sloping ground, the content will be found by the method which will now be explained.

Fig. 3.



Let R S (fig 3) represent the centre line of the road, C P the line in which the plane A C P of the natural surface of the ground intersects the base of the excavation, A B C a perpendicular plane at right angles to R S passing through C, A B P will be the side slope of the excavation, B C the base and E F the depth at the centre. The content for the distance R F is found by formula ( ) as in example 10, and the content of figure A B C P is

found by formula (L). When the pyramid A B C P is of importance, the depth and transverse slope at F and the length B P must be measured on the ground, but as this may not always be convenient it will be proper to indicate a method of finding them approximately by calculation.

The transverse slope may be assumed as varying uniformly from R to S; the distance from R to O is found as in example 5; then as depth at station R is to that at F, so is length R O to F O, and B P is equal to 2 F O.

EXAMPLE 12. There is 12 feet excavation at one station and 8 feet embankment at the next, transverse slopes 12·° and 14·°, side slope 1 to 1, base 30 feet and length 100. Required the quantity of excavation and embankment, the base of embankment being 25 feet and side slope $1\frac{1}{2}$ to 1?

$$\text{Here, } 12 + 8 : 100 :: 12 : 60 = \text{R O},$$

and taking 13° as the transverse slope at O we have $\frac{B}{2} \times \tan.\ 13° =$ depth at $F = 3{\cdot}5$, then, $12 : 60 :: 3{\cdot}5 : 17{\cdot}5 =$ F O and B P $= 2 \times$ F O $= 35{\cdot}0$, formula (L), for a pyramid reduces to $H^2 \times A \times \frac{L}{3}$.

H′, A′, a and a' being each $= 0{\cdot}$ which is the common rule for the solid content of a pyramid.

Here, $H^2 = \left(\frac{B}{m}\right)^2 = (30)^2$, L = 35 and A from table XXIV = ·1501.

$H^2 \times \frac{100}{27} = (30)^2 \frac{100}{27}$ from table XXII, - - 3333· c. yds.

5710

$A \times \frac{L}{3} = \frac{\cdot 1601 \times 35}{3 \times 100} = \cdot 05 \times \cdot 35 = \cdot 0175,$ - - 333

233

17

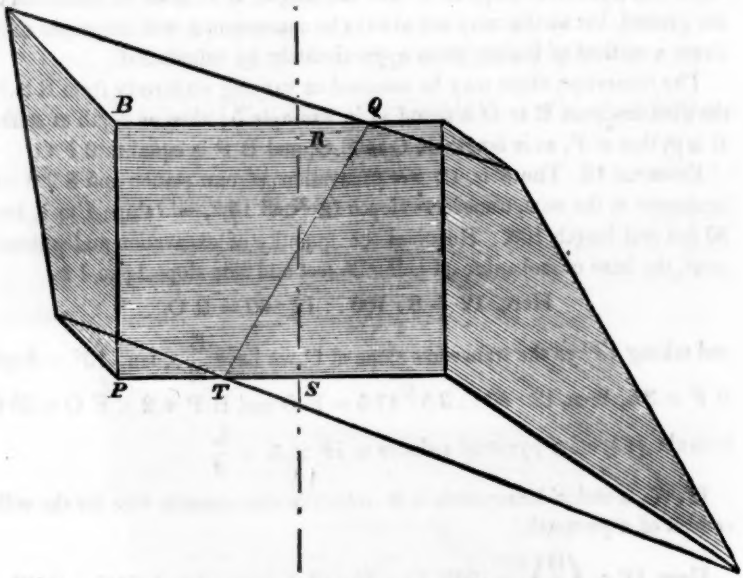
Content of pyramid, - - - -	58·3 "
Content for length R F calculated as in example 10, -	512· "
Total excavation, - - - -	570· "

The transverse slope for the pyramid of embankment will be nearly $13\frac{1}{2}°$ and the content calculated in the same way as for the pyramid of excavation is - - - - - 44· c. yds.

And the embankment for the remainder of the distance, -	215· "
Total embankment, - - - -	259· "

When the transverse slopes at R and S (fig. 4) cut the base, so as to make one side of the roadbed in excavation and the other in embankment, the distances of these points from the centre line Q R and S T can always easily be measured on the ground, or they may readily be obtained by multiplying the natural cotangent of the transverse slope by the depth at the centre; whence the widths in excavation and in embankment are found, and the contents calculated by equations (L and M) as in example 10.

Fig. 4.



EXAMPLE 13. Given at one station 2 feet cutting and transverse slope 12°, at the next 1 foot filling and transverse slope 14°, length 100 feet, in excavation base 30 feet, and side slope 1 to 1, and in embankment base 25 feet and side slope $1\frac{1}{2}$ to 1; required the contents?

Here a and a' being nothing, equations (L and M) become*

$$\left\{ H^2 + H'^2 + (H + H')^2 \right\} (A + A') \frac{L}{12} = \text{content.}$$

$$(H^2 - H'^2)(A - A') \frac{L}{6} = \text{correction.}$$

$$H = \frac{1}{m}\left(\frac{B}{2} + 2 \times \cot. 12^\circ\right) = 15 + 9{\cdot}4 = 24{\cdot}4$$

$$H' = \frac{1}{m}\left(\frac{B}{2} - 1 \times \cot. 14^\circ\right) = 15 - 4{\cdot}0 = 11{\cdot}0$$

$\left\{ H^2 + H'^2 + (H + H')^2 \right\} \frac{L}{12}$ from table XIV,	-	608 c. yds
		1103
$A + A' = {\cdot}1350 + {\cdot}1661$ from table XXIV,	- -	1824
		6
Content,	- - - - - -	183· c. yds.
$(H^2 - H'^2)(A - A') \frac{L}{6} =$ correction,	- - - -	—9 "
Total excavation,	- - - - - -	174 c. yds.

For the embankment,

$$H = \frac{1}{m}\left(\frac{B}{2} - 2 \times \cot. 12^\circ\right) = \frac{12{\cdot}5 - 9{\cdot}4}{1{\cdot}5} = 2{\cdot}1$$

$$H' = \frac{1}{m}\left(\frac{B}{2} + 1 \times \cot. 14^\circ\right) = \frac{12{\cdot}5 + 4{\cdot}0}{1{\cdot}5} = 11{\cdot}0.$$

Then, $\left\{H^2 + H'^2 + (H + H')^2\right\}(A + A')\frac{L}{12}$. 72·7 c. yds.

$(H^2 - H'^2)(A - A')\frac{L}{6}$ - - - - - 3·5 "

Total embankment, - - - - - - 76·2 "

When the ground is so uneven that the transverse slope cannot be accurately taken in degrees, and it becomes necessary to take the depths at several points in the cross section, the following method will sometimes be found a convenient approximation.

To the area of the cross section of the excavation add $\frac{B^2}{4\,m}$ and divide by m, then, from a table of square roots, take the square root of this quantity for the depth on H, and calculate the content from table XXII as in example 6.

Or the content may be calculated by the following general rule which is to be found in any treatise on mensuration.

Multiply the sum of the end areas and four times the middle area by one-sixth of the length for the content.

MEMORANDUM—CUBICAL QUANTITIES.

At the time the "Notes" on this subject were written, I had not seen the paper of Mr. E. Morris, C. E., in the Franklin Journal, in which he shows the application of the "prismoidal formula', to all cases; more especially to determining the quantities for final estimates where the ground is very difficult. This able paper well deserves the attention of the engineer; and, together with the published tables, will give all desirable assistance in the rough estimates from preliminary surveys, as well as in the careful and often tedious calculations for putting the work under contract.

In the paper on "Bridges," there is a typographical error, (p. 9,) I wish to correct. For "screwed in" read covered in. Also at the close of Notes on "Wharves," for "filling" read piling.

New York, May, 1844. W. R. C.

NEW ROTARY ENGINE.

The inventor, Mr. Peter Borrie, says:

"I am aware that many patents have been taken out for revolving engines, and have successively failed, owing chiefly to defects in their construction; these failures have prejudiced the public mind against all engines on that principle, but from the long experience I have had (both practically and theoretically) with steam engines of every description, I flatter myself that I have entirely remedied the defects common to revolving engines; and from the lightness, compactness, small amount of wear and tear, and greater economy of fuel in my engine, I have no doubt that it will surpass all others hitherto in use." * *

"Among the advantages which render this improved steam engine so peculiarly well adapted for locomotive and marine purposes, may be mentioned the following, viz: small cost of construction, great economy of fuel, the space occupied by it is very little in pro-

portion to its power, and also its comparative lightness, the weight of the engine being only about 2 cwt., per horse power, and that of the boilers only about 2 3-4 cwt., per horse power, so that the whole weight will only be about one-half of the lightest engine hitherto constructed."

He then goes into an elaborate calculation of the power of this as compared with the ordinary engine, and concludes with the following startling announcement:

"Consequently only about one-third of the fuel would be required for the revolving engine as would be required for a common reciprocating condensing engine of the same power."

The general plan of the engine appears to us exceedingly ingenious, and likely to be effective. The patentee truly observes, "that the principle of expansion is carried out to its fullest extent, without the aid of expansion valves and gear." But the best reciprocating engines give us two-thirds of the total power of the steam at the "working point;" and we do not very clearly see how any engine can give three times as much power as those which only lose one-third of the whole. An efficient and simple rotary engine would, however, be of such vast importance to railways, by simplifying the machinery, as well as by enabling us to obtain the adhesion of any number of wheels, that we regard with interest every attempt to effect so desirable an object. We hope to hear soon something more of this revolving engine, and shall be happy to lay before our readers a full description and illustrations as soon as we learn that it has stood the test of experiment.

We copy from the "Civil Engineer," for May, the following admirable review of a letter on "Railway Administration." We should be pleased to see the letter itself, but this is more than doubtful, and indeed we regret it the less as the subject has been so well handled by the editor of that leading Journal of the profession. It was our intention to have omitted some passages uninteresting to the American reader, but we find them so few that we give the article entire. It furnishes matter for deep and serious reflection, and incidentally though very ably illustrates some points we endeavored to establish in our "Remarks on the Profession." We allude to our views with regard to general information, and the necessity of a high moral tone in all engineers entrusted in any way with the projection of works. The railway cause generally is well sustained, and last though not least to us, the creation of a railway press, and its powerful effects on the extension of public works are forcibly dwelt on. We trust we shall be pardoned for observing that we were the first to take the field under the railway banner, and though occasionally hard pressed during the last few years, we still continue to aid—to the best of our ability—the development and extension of an improvement—we may say an invention—second to few in the bearing it is likely to have in the welfare and advancement of the human family.

RAILWAY ADMINISTRATION.

"We have seldom seen a more masterly exposition on the subject of railways than is to be found in this brief pamphlet; if, therefore, we dissent from its reasonings and the remedies it proposes, it is because we draw dif-

ferent conclusions from the same premises, and regard premises upon which our author has not argued. At a time when rant and cant are so prevalent with regard to railways, and a pretext is earnestly sought to hunt them down, it is matter of great consolation to find an advocate so staunch come forward to defend them, one earnest to do them due justice, at the same time too impartial to defend their errors. Those, however, who have deeply studied the subject, and been intimately connected with them as our author has been, know that railway bodies have been much more sinned against than sinning, and will feel cautious in what way they interfere with an institution which has shown and possesses such elements of good. The railway system of England is both a moral and physical phenomenon of the age. A connected chain of public ways extending over 1800 miles, and in the construction of which 60 millions sterling have been embarked, the largest sum ever yet applied in any country in bulk to any other purpose than that of war, naturally excites attention to the colossal magnitude of the enterprize, but the moral features are still more deeply interesting. Not only has this vast sum been raised by private means, and expended under private direction, but difficulties of the most serious character have had to be contended with. At every step experience had to be acquired, invention exerted to overcome difficulties and establish new precedents, the immense amount of money required and expended, enhanced the cost of procuring it, and the price of every kind of labor and material. No colony, no new political institution, was ever formed with such difficulties and such success as the railway system; financiers, engineers and contractors had to be created, while, as we have said, the very vastness of the works have enhanced the cost of their execution. It is well, at the present time, and with our present experience, to turn round and say the railways could have been executed for less. It is true, if, as our author says, there had been no parliamentary contests, no law, no extravagant landed compensation, that much might have been saved, but we are not quite so sure as he is that the future lines to be executed will cost only the present moderate rate, and we deny, therefore, the propriety of measuring things by the present standard. At this time money is abundant and interest low, so is the price of labor and materials, and as many contractors have been ruined, and none have too much work, a line can be let at a very low price. Prices are however rising, and will rise; labor will cost more, timber will get up, iron double in price, to say nothing of a crisis by and bye, and the serious consequences of depression in the money market, which it is in the nature of events to bring about from time to time. We would not have contractors or engineers blind to these facts, for it was to such facts that many difficulties were owing at a previous period. The much vilified estimates of Stephenson, Brunel, Rastrick, Braithwaite, etc., were founded upon works actually executed, but, in the interval, a most serious difference in prices was created by the number of contracts in the field. While, however, we expect prices to rise as a matter of course, we do not anticipate the serious excesses of the old system, because many of the difficulties have been overcome. In the infancy of the railway system, as the development of traffic was not foreseen, so neither was the cost of stations duly provided for, then it must be remembered that in those days contractors were not used to works so gigantic, and were not so competent to undertake them. Now, the weight of locomotives is ascertained, and the rails will not have to be increased in weight 50 per cent. above the estimate, as was the case previously in consequence of the experience gained in the course of the working. Now many and economical arrangements are well known, people are not afraid to lay down timber bridges, as to which formerly much prejudice prevailed.

" We say that this experience, now so advantageous, had then to be gained and to be bought at every step, and that the old system instead of being chargeable with blame, is deserving of the highest degree of praise and admiration. Few know the burden which weighed on the minds of railway managers in those days, and rarely have exertions so great been made, and received so little appreciation. Our author graphically describes the difficulties of the panic.

" 'Still worse was the condition of some other lines two years later. The commercial embarrassments that weighed so heavily upon the country bent them to the ground. The proprietors were totally unable to answer the calls upon them. No credit could be given, no money could be obtained. Contractors failed, works were stoped, loans were raised at usurious interest, capital was provided at a sacrifice of one-third of its amount. Whatever censure boards of directors deserved in other matters, at this time they stood forward manfully to face the storm. Many of them supplied large sums from their individual resources, and pledged their credit to a frightful extent. They risked ruin for the benefit of their fellow proprietors, which they never would have hazarded for their own. Few know the perilous state of some of these now flourishing concerns, or of the anxious days and sleepless nights of those who had to provide the sinews of war, to uphold a sinking credit, and ward off impending bankruptcy and ruin.'

" We disagree with him, however, as to railway directors pushing on the works at any cost, *because* they were deeply imbued with the gambling spirit of the day. They pushed on the works as a matter of financial necessity, to which they were in the strongest degree urged by their proprietors. To the bulk of the then holders on the realization of a traffic and a dividend depended the tenure of their property, often whether they were to be rich men or beggars. When the panic came, the resources of many became inadequate to meet the heavy calls; they had to borrow or to hold on by any means. To go into the market and sell was ruin, to hold was their only chance, until the opening of some portions of the line made their shares a better security, or until the subscription of two-thirds of the capital enabled the companies to postpone the calls, and raise money on debentures. Any sacrifice of capital to gain time was preferable to throwing shares on the market, where scarcely any description of property was at par, while the perils of forfeiting everything by non-compliance with the act of parliament made shares without a traffic totally unavailable as a security for raising money. When all these circumstances are taken into consideration, railway managers will not be censured for excesses of estimates, which circumstances alone produced.

" The evils produced by the legislature the pamphlet before us well shows, it particularly dwells on the legalized extortions of land owners, and the prohibitions of level crossing of common roads, which, of course, it proposes to remedy.

" We have now, therefore, to consider the present state of the railway interest. We have so many hundred miles of railway, costing so many millions, and as a new institution has arisen, new public wants have been created, first and foremost of which is cheap travelling. In a national point of view, there can be no question upon this subject; cheap travelling is in the highest degree desirable: how is it to be obtained? Every one has his remedy; and the legislature is called upon by many well meaning individuals to cut the Gordian knot, and to buy up the whole of the railways; others, among whom our author is one, propose modifications of this principle. For our own part, we are most free to admit, that on the leading lines of traffic

the charges for travelling are absurdly high, and the accommodation for the laboring classes totally inadequate; still we are inclined to say that it is better to let the matter alone than to legislate upon it. The mischief hitherto has been in legislating for questions of public enterprize, imposing restrictions and giving privileges, which are the fertile sources of mischief, and we anticipate little good therefore from any legislative remedy, the most efficient in such cases being, in our opinion, to legislate as little as possible, but to proceed upon the broad economical principle of leaving industry to regulate itself. Not that we doubt the right of the legislature to interfere in this specific case, or in any similar case. Apart from the question of rails and locomotives, shares and shareholders, the railway system is an institution having the same public relations as a bank, a college, a hospital, or a public house, and in which any rights of private property exist subordinate to the public objects. On the equity of the case, it must be remembered, that if railways have been allowed a maximum fare, it was on the express condition that anybody should be allowed to compete with them on their own lines. This, however, is found to be injurious to the public, and the legislature has, therefore, the equity of requiring some other equivalent security for a reasonable rate of fare. Our ground for letting the railways alone on the subject of fares is, that it is more remunerative for railway companies to charge low fares than it is to charge high fares, and that this principle is making satisfactory progress, and must and will be adopted by all companies. The following observations from a very able article in the Railway Record, will be read with interest.

"'A very large amount of manufacturing business has been created by the railway system, for the supply of railway stock, and this will be ever on the increase, not merely for England alone, but for her colonies, and for foreign lands. We are prepared to see railways rise in value, in the same proportion that canals have risen. For although it be true, that the price of making railways has been reduced very low of late, it is quite certain that, with increasing traffic, those prices will rise. When railways shall commence in the East and West Indies, in Australia and China, English capital will find so many vents, that the intense existing competition will be lessened, and assuredly the value of land will rise as our population thickens. The greater the numbers of the community the more valuable will the roads become. England will be virtually the metropolis of the continent, by means of free communication throughout all lands.

"'Nothing can defeat railway prosperity, but, at the same time, nothing can check it so much as injudicious high fares. We cannot too strongly insist on this point. The increase of expenses in railways is great in proportion to the diminution of traffic, and the increase of traffic is followed by a very slight increase of expenses on the annual amount, while the proportionate decrease is very great. People are gradually getting used to travel, the circle continually widening, and as they get used to it, it becomes a necessary of life. They can no more do without it, than they can forego their provisions. But they must be inoculated to it, and this inoculation will not take place while they are frightened by high fares. We are of opinion that it would be a wise thing for railway companies to establish some rule in lowering their fares in proportion to the increase of their passengers. It is the largest number that will pay best, in all cases, and we apprehend that the lowest fares will also pay best, unless where the number of passengers is limited.'

"The author before us certainly does not go far enough for us in his proposed legislation, for he is content to have open third class carriages at $\frac{3}{4}$*d.*

per mile, attached to all trains. Now we think as a matter of public health it is desirable that all trains should be covered, as in Belgium, and that sufficient distinction in comfort will always exist between the several classes of carriages. Third class carriages should be provided with seats, covered with tarpaulin, and have curtains; and second class carriages be first class carriages without the cushions. In practice this arrangement has worked well, and will work well. On short omnibus lines, however, open stand-up carriages do no harm. On all lines a step remains to be taken, which may be pursued with advantage, we mean the running of slow, cheap trains, going at the rate of some ten miles an hour. Such trains can be worked much cheaper than high speed trains, and there are large classes of the public to whom time is of less importance than money, females in particular. All these things, however, may be safely left to experience, and experience is beginning to show that a high fare is the wrong system for extracting the greatest revenue from a railway. The cheap fare system is satisfactorily progressing, and will establish itself without legislative aid. A great many experiments are also being made as to excursions, return tickets, weekly, monthly, season and yearly subscriptions, the results of which are promulgated by the railway press to the general information. Here, too, we may observe, that it is not one of the least remarkable features of the railway system, that it has created a press, by the competition and energy of the members of which a degree of information is diffused which has been productive of the greatest benefits, and which under no central administration could exist. By the means of this agency upwards of a hundred reports of directors and engineers are yearly brought under the scrutiny of the great body of railway capitalists, while the comments of the shareholders at the meetings are recorded at a length, and with a degree of accuracy only surpassed by the reports of the houses of parliament. This is totally independent of the weekly communication of every kind of intelligence, and the keen investigation of a number of editors experienced on the subject, and solely engaged in such discussions. Indeed it is not one of the smallest marvels of the railway system to see one of these papers with more than thirty of our pages of close type recording the minutest details of railway management, and the most trivial observations of the humblest shareholder or official, for the perusal of many hundred railway directors, secretaries, engineers and functionaries. The loss of such auxiliaries consequent on the centralization of the railways by government, would deprive us of an engine of improvement which no other machinery could supply, even supposing the government to be willing at its own risk to keep up for the benefit of its functionaries a Railway Journal, or Railway Record, for even if it found the money it could not find the materials. Seeing the influence which this press has in the diffusion of intelligence and the propagation of truth, we are quite satisfied that the directors still holding out against low fares will not be for long.

"The grand remedy, however, we think, lies in improving the arrangements for obtaining acts of parliament. This our author has also turned his attention to, but we think he has not struck at the root of the evil. In common with many other individuals he has the customaay horror of projectors and share jobbers, and for the sake of remedying any evil connected with share jobbing, he is willing to sacrifice the interests of the community. We say give every facility for obtaining acts of parliament for railways, harbors, docks, bridges, and all useful works, take no trouble about whether the work will pay, or whether the parties have money to carry it on, leave them to look after that themselves, and do not for the fear of encouraging share job-

bing prevent people from carrying out useful works. Let such parties also have the power of raising as much money as they can upon the work, and let the parties lending the money look to their own investigations for the security, and not to the legislature. We know these are views diametrically opposed to the prevailing practice, but let them be canvassed and they will be found to be right. Depend upon it, the more trade is left to regulate itself, and the more it is carried on by private enterprize, the better. The public is very well able to protect itself, and to form its own judgment as to the advisability of an investment without any legislative aid on the score, which after all is totally erroneous—for have not many of the lines, guaranteed by parliament to pay five per cent., been for years without a dividend, and others on the contrary surpassed all parliamentary calculations. As to the bubble companies, we have no fear on that head; West Middlesex swindlers may exist as they have existed, but a whole community is not to be fettered to prevent the perpetration of crime. Give every facility for obtaining railway bills, relax the standing orders, do away with all deposits, and you need entertain no fears about existing lines charging high fares. Here, too, we may observe that nothing could be more absurd than the doctrine lately held in the legislature, that no new line should be authorized to compete with an existing railway, for the more railways the better for the public at large. The idea, too, of the vested interest of a railway in the traffic between particular towns is supremely ridiculous, for it is evident that it did not regard the vested interest of the turnpike road it superceded. No one can have a vested interest in abuse, and it is an abuse to subject the public to a high rate for travelling, when they can be carried more cheaply.

"The suggestions of the author, that the five per cent. government tax on railways might be appropriated as a tax for buying them up, is an exceedingly good one, and we think such a fund might be advantageously applied in the gradual purchase of shares at the market value without involving any great interference with the grand principle of private enterprize, for after all, what we have to look to is not what we shall do with the present railways, but how we shall keep up the national energy, by which such great works have been prosecuted, and by which still greater things can be effected in our own country, and in our vast colonial empire."

COST OF TRANSPORTATION.

The interesting and flattering statements of the Delaware and Hudson canal company, for 1842 and 1843, will be fresh in the recollection of our readers. We allude to them again in order to give some explanations which appear to us important. Since the appearance of these statements in the *Journal*, we have been informed that the amount charged to the railway includes many miles of new line of road, as well as a very different arrangement of the entire "modus operandi" on the eastern side of the mountain. The canal has also been improved, hence the actual cost to the company cannot be stated with the accuracy we should desire, from any data in our possession. It will be seen that the greater quantity brought down in 1843 cost less than the smaller quantity of 1842; and it is probable that the next statement will show a still greater reduction. We have heard also that some portion of the coal was sold at three dollars and a quarter per ton. The account our informant gives us of the style in which the works are carried on, has made us desirous of a detailed account of the operations of the com-

pany, as far as they fall within the scope of the *Journal*, and when winter brings a little leisure we hope our wishes may be gratified. The results of the new arrangement are, we understand, highly favorable to the railway cause.

Mr. Nicolls, the superintendent of the Reading railroad, states the actual cost on that work, 93 miles long, to be 46 cents per ton, (*Journal*, March, p. 83,) which is at the rate of 4·95 mills per ton per mile. The average load was 160 tons nett, and the return of the empty cars is included in the 4·95 mills per ton per mile.

The Baltimore and Ohio railroad company estimate the cost at ·941 cents per ton per mile, with loads of 210 tons, and ascending gradients of 26·4 feet per mile. In this estimate the cost of locomotive power is 2·28 mills per ton per mile, and with the gradients of the Reading railway this would be reduced one-half, and the estimate of the Baltimore and Ohio company would be $\cdot 941 - \frac{\cdot 228}{2} = \cdot 827$ cents per ton. This is nearly twice the estimate of Mr. Nicolls, and it is obviously intended to be high enough. Again, the latter gentleman may not include renewals of railway. In that event the account would stand thus—actual expenses, ·495 cents

Renewals of track, bridges, etc., - -	·250 "
Contingencies, - - - - -	·100 "
Total cost on Reading railway, - -	·845 cts. per ton per mile.

This agrees with the Baltimore and Ohio company's estimates very nearly.

While on this subject, we would observe that the objections to high grades may be carried too far, and that too many imagine that, because an engine on the Reading railway can draw twice as much as on most of our railways, therefore the cost of transportation will be reduced one-half. This investigation, however, to be thorough, requires a complete examination into the details of each peculiar case, and we must refer the reader to Mr. Ellet's papers, to Mr. Casey's paper, (Aug., 1839,) and to the report of Mr. Vignoles' lecture—the two former written for the *Journal.*

It will be remembered that the cost on the Cumberland canal is about the same, and the experience of Pennsylvania shows, that with boats of 70 tons burden, seven mills per ton per mile, even for long distances, yields but a sorry remuneration to the boatmen. Still coal is carried at that rate, and where the business is very great, and where small or nominal dividends only are expected, coal may be carried on some canals for one cent per ton per mile.

ATMOSPHERIC RAILWAYS.

We gave in the January number of this Journal, an article on "Atmospheric Railways," from the Glasgow "Practical Mechanic and Engineers' Journal." We now give further details in relation to this interesting subject, in a letter from one of the patentees, in reply to inquiries made by the South Carolina railroad company, through Messrs. Palmer, Makillop and Co., of

London. In the Railway Times, of May 18th, we find the commencement of a report of an examination before a select committee of parliament, in which Mr. J. Samuda gives a minute description of the construction of the *atmospheric working* apparatus—to which we shall refer hereafter.

In our next number we shall republish most of a "Treatise on the adaptation of *Atmospheric Pressure*, to the purposes of Locomotion on Railways;" with engravings, illustrating the mode of connecting the cars with the atmospheric apparatus; together with a statement of the cost of construction, and expense of working, as compared with the locomotive system—based upon actual operations.

This system, like all *new* theories, especially if of great importance, has to work its way against the prejudices of the community, and in this case against the interests of leading men connected with railroads in England—consequently its progress has been gradual, and mainly at the cost of those immediately interested in it; but if the statements now before us are to be relied on, we are of the opinion that it will at no distant day, *supersede* the present mode of working railways; and that the improvement in *safety*, *economy*, and speed will be *as great over the present system* as that is over the *almost* obsolete stage coaching of former days.

We give, in this number, a short extract from this treatise, which, if accurate, places the two systems in a position exceedingly favorable to the atmospheric. We shall be gratified to receive the views of our correspondents on this interesting topic for publication in the Journal.

We are under obligations, for these documents, to J. E. Bloomfield, Esq., who will please accept our thanks.

Mr. D. K. Minor: By the last steamer, I have been favored with a copy of Messrs. Samuda, Brothers' communication, giving the cost of laying down a mile of atmospheric railway, as well as the cost of working the same—being a reply to an application from a railway company in this country, who desire to dispense with stationary power, on an inclination of 360 feet to the mile.

It would appear by Messrs. Samuda's letter, that the atmospheric principle of motive power, costs 5½ pence sterling per train per mile to run 50 miles in the hour—while the *slow* locomotive engine, to run 25 miles per hour, costs 15 pence, or nearly three times as much, to run with half the speed, and with greater risk, as I understand it, to the passenger.

I would claim your notice of the remarks of the editor of the London Railway Times, of the 18th May, as well as the first part of the examination of Mr. J. Samuda before a committee of the house of parliament, also a description of his plan.

"To apply the subject"—allow me to ask, if the atmospheric railroad is what its friends claim for it, why not adopt this plan to make a railway to Albany? The charter of the New York and Albany company will cover the application of this principle, and as the objection heretofore has been that

a railway could not compete with the North river steamboats, it is to be hoped that this interesting subject will claim the early attention of our engineers and mechanics. We must not be behind England—in this "*go ahead, age*," particularly, when we have got Professor Morse's magnetic telegraph, to announce in forty seconds that **30** cars, carrying **1500** passengers, in three hours from this city to Albany, after breakfast, desire that the requisite arrangements be made for dinner, so as to be in time to take tea at Buffalo, over **320** miles of intervening railway.

Very respectfully, J. E. B.

Extract of a Letter from a Railway Company at Charleston, to which Messrs. Samuda's Letter is a Reply.

"We have on our railroad an inclined plane of **360** feet to the mile, which at present requires stationary power to overcome, but which we are desirous of dispensing with. From the examinations made, the operation will involve no little expense, and we have been deterred from proceeding by a notice which has appeared in the English Journals on the success of the atmospheric railroad between Dublin and Kingston. We are inclined to the opinion, from what we have read on the subject, and from our own calculations, that this atmospheric power may be applied most advantageously to planes, and particularly where the plane is not to be avoided but by a circuit and increase of distance, involving no ordinary expense—we will, therefore, esteem it a very great favor rendered to our company if you will obtain from General Pasley, R. E., J. Brunel, Esq., M. Mallet, or Mr. Vignoles, or from any other competent source, the real practical results of the experiment now making, with the cost of construction per mile, and the power exerted, with the advantages of this power compared with steam, on the various inclinations of a railroad. We would be pleased to have the arguments both pro and con., so that we shall be the better able to decide on the two questions which present themselves.

"*First.* The expense of reducing the grade of inclination at our plane by a circuit, and

"*Second.* The expense of overcoming the inclination and delay at the plane by the new power."

Copy of Letter from Messrs. Samuda, Brothers.

"*Southwark Iron Works, April* **30, 1844.**

"Messrs Palmer, Mackillop & Co.

"Gentlemen: We beg to acknowledge the receipt of your inquiries respecting the atmospheric railway, and in reply beg to hand you the following information which we regret will not, in all probability, be as complete as your friends might wish, owing to the want of some information which their letters do not supply, and which we would feel obliged by your obtaining for us. Thus, the *length* of the inclined planes is not named. We can only, therefore, in the present instance, give them such general information as we hope may be useful.

"The diameter of the vacuum pipe which we recommend in all ordinary cases is 15 inches; this will draw

200 tons on a level,	48 tons up 1 in 80,
80 " up 1 in 160,	44 " " 1 " 70,
65 " " 1 " 120,	39 " " 1 " 60,
58 " " 1 " 100,	33 " " 1 " 50.

"Up such an incline as you name (360 feet per mile, or 1 in 15 about,) it will take 12 tons, which, in all probability, will be too small a load, if so, however, the area of the pipe will require to be increased till it meets the load you deem sufficient—probably 20 to 25 tons will suffice, in which case a pipe of 22 inches diameter will be required on that incline.

"The engine power necessary depends on the speed you require the trains to travel—thus with a pipe 15 inches diameter, (which is capable of drawing any of the loads on the corresponding gradients mentioned in the annexed table,) an engine of 100 horse power will be sufficient for a speed of 50 miles per hour, or 68 horse power for 30 miles per hour.

"The distance apart the engines should be placed will be slightly influenced by local circumstances, but will average 3½ miles from each other. We have subjoined a table showing the working expenses on the atmospheric system on a long line of railway, similar to the London and Birmingham here, and performing the same amount of traffic; from that statement, the cost of haulage on the atmospheric system, travelling at 50 miles per hour, is - - - - - - $5\frac{5}{10}$*d.* per train per mile, while the present cost with locomotives, at the present speed of 25 miles per hour, is 1*s.* 3*d.* " "

"In the maintenance of way there is also a saving on the atmospheric system, for the destruction caused by the locomotive engine to the rails, and the way itself, is entirely avoided, and in its stead, we have only the expense of attending the mains, and which in practice we find fully provided for with one laborer per mile.

"The cost of the atmospheric apparatus will of course be slightly influenced by local causes, the price in London will be as follows:

15 inch vacuum pipes, about 309 lbs. per yd. = 272 tons per mile at £6, - - - - -		£1632 per mile.
"Continuous valve and fastenings, viz:		
Wrought iron plates and bars, 18½ tons, -	£129	
Leather, 42 cwt., - - - - - -	324	
Bolts and nuts 24 cwt., - - - -	67	
Labor, rivets, oil, tools, etc., - - - -	250—	770 " "
Tallow lining and composition for grove, - -		250 " "
Planing, drilling and lining with tallow, 3*s.* 4*d.* per yard,		295 " "
Station valves, about - - - - - -		50 " "
Travelling piston and gear, - - - -		50 " "
		£3047 " "
Drawings, superintendence, specifications, etc., say 5 per ct.,		153 " "
		£3200 " "

"The cost of a vacuum main, 22 inches diameter, will be £4200 per mile.

"Table of working expenses of the atmospheric system referred to, on a line similar to the London and Birmingham railway, 112½ miles long, and performing a similar traffic.

Coal—each engine burns 500 lbs. per hour, and
works for each train - - - $8\frac{1}{4}$ min.
Add for waste while standing, 1*s.* 3*d.*, - $2\frac{3}{4}$ min.
11 min. = 92 lbs.

32 engines × 92 lbs. = 2944 lbs., or 1 ton 6 cwt. 1 qr. 4 lbs., at 9*s.*, 11*s.* 10 *d.*

Wages—33 engine stations, each 2 men at 6*s.* " " " 3*s.* } 18*s.* $\frac{18 \times 33}{30 \text{ trains}}$, 19*s.* 9 *d.*

Repairs to engines, oil, hemp, etc., 5 per cent. on cost, say per year, $\frac{£212\ 10s. \times 33}{30 \text{ trains} \times 365 \text{ days}}$ - - - - 12*s.* 10 *d.*

Piston leather 2*s.*, charcoal 6*d.*, wear and tear of travelling gear 4½*d.*, 2*s.* 10½*d.*

Superintendence, clerks, foremen and office expenses, say £2500 per annum, $\frac{£2500}{33 \times 365}$, - - - - - 4*s.* 6½*d.*

Total haulage = $5\frac{5}{10}d.$ per mile, - - - 51*s.* 10 *d.*

"Any other information which your friends may require, we shall at all times be happy to furnish. We are, etc.

[Signed,] "SAMUDA, BROTHERS."

Messrs. Samuda, Brothers, having omitted to state the cost of stationary engines, they write on 10th May as follows:

"We regret that we should have omitted the price of the stationary engines in our particulars of the atmospheric apparatus furnished you.

"The price of two 50 horse condensing engines with their vacuum pumps and apparatus complete in every respect, and put on board a vessel in the Thames, will be - - - £4250

"A pair of 34 horse engines and pumping apparatus as above, 3060."

ON THE ATMOSPHERIC SYSTEM.

"1st. The loss of power occasioned by the locomotive engines having to draw their own weight is entirely avoided, and steep hills may be ascended with no more additional power than that actually due to the acclivity, as there is no weight except the train.

"There is no other known power which can be applied to locomotion without carrying considerable weight and friction with it. The ill effects of locomotive engines have been already pointed out, and the same disadvantages exist in the application of ropes, which must be drawn along with the train, and become an increased incumbrance on inclined planes. The defects of ropes in other respects are too generally known to need comment.

"2d. The weight of the rails and chairs on the new system may be less by one-third than where locomotive engines are employed, as the carriages of the train will be too light to injure them. The annual charge of maintenance of way will, from the same cause, be reduced to a considerable extent.

"3d. The wear and tear of locomotive, compared with stationary engines, is as 18 to 1.

"4th. By the new system the full power of the engines is always obtained; and on an incline the additional quantity of fuel consumed in ascending will be saved in descending, as the trains run down by their own gravity. The expense of fuel will be further decreased, as the expense of using coal is only half that of coke.

"On the new system the velocity depends entirely upon the velocity with which the air

is withdrawn from the pipe; therefore, by simply increasing the air pump, any speed may be attained; and with a fixed quantity of traffic per diem, no considerable increase in the fuel consumed or any other expense is incurred for improving speed, further than the small additional power required to overcome the increased atmospheric resistance. An actual saving in the first cost of a railway constructed for high velocities may be effected, because by performing the journey in less time, a greater number of trains may be despatched each day, and their weight diminished; therefore the piston, having less to draw, may be smaller in diameter. The cost of the pipe (which forms the largest item in the first cost of this railway) will thus be reduced in nearly the same proportion as the speed is increased.

"Besides these advantages, the system possesses others of still more importance to the public. No collision between trains can take place, for as the power cannot be applied to more than one piston at a time in the same section of pipe, the trains must ever be the length of a section apart from each other; and if from any cause a train should be stopped in the middle of a section, the train which follows it will be obliged to stop also at the entrance of the pipe, as there will be no power to propel it until the first train is out. It is also impossible for two trains to run in opposite directions on the same line, as the power is only applied at one end of each section. A train cannot get off the rail, as the leading carriage is firmly attached to the piston, which travels in the pipe between the rails, and the luggage and carriages cannot be burnt, as no engines travel with the trains.

"We now come to the comparative cost of the two systems.

"1st. The necessity of having the railway comparatively level causes the present enormous outlay for earth work, viaducts and tunnelling, and increases the cost of land, not only by lengthening the line to save cutting and embankment, but by the quantity wasted on each side of the road wherever such work is required. Thus, if an embankment or cutting has to be made of 30 feet, at least 60 feet of land must be covered on each side of the railway in order to obtain sufficient slope, making a width of 120 feet, besides the road, except where they occur in very favorable ground. The comparative expense of this item, between the two systems can be ascertained by referring to the average cost of forming a turnpike road and that of the principal railroads now in operation.

"Since it is not necessary to make detours to avoid steep gradients, the direction of the road in a straight line may be more nearly preserved."

LOCOMOTIVE SYSTEM.	Per mile.
Taking five of the principal railroads as the basis of our calculation, their average expense of formation has exceeded* - - - -	£36,000
And the original stock of locomotives, - - - - -	1,600
	£37,600

ATMOSPHERIC SYSTEM.	Per mile.
The average expense of forming a turnpike road throughout England has been £3000 per mile, but for our road say - -	£4,000
Allow extra for road bridges, - - -	2,000
Rails, chairs, sleepers and laying down, - - -	2,500
Main pipe and apparatus complete (on a scale for transporting 360 tons per hour, or 5000 tons per day of fourteen hours, on a road with gradients of 1 in 100), - - - -	5,200
Fixed engines, air pumps, and engine houses, - - -	1,400
Travelling pistons, - - - - -	20
	15,120
Saving per mile in forming and furnishing on the atmospheric system,	22,480
	37,600

Annual expenses of working per mile, when conveying two thousand tons per day. (This is beyond the average quantity conveyed on the Liverpool and Manchester railroad:)

LOCOMOTIVE SYSTEM.	Per mile.
5 per cent. interest on capital invested, £37,600, - - - -	£1,880
Maintenance of way, - - - - - -	450
Locomotive department, including coke, - - -	1,800
	4,130

ATMOSPHERIC SYSTEM.	Per mile.
5 per cent. interist on capital invested, viz., £15,120, -	£756
Maintenance of way, and attendance on mains, - -	300
Wear and tear of fixed engines, 5 per cent. of cost, - - -	70
Coal, 0·75 lb. per ton per mile, 214 tons, at 20s., - -	214
Wages to enginemen and strokers, - - - -	60
	1,400

*Our calculations are founded on the reports of different companies whose railways are complete, or in a forward state.

	1,400
Wages to train conductors, - - - -	26
Renewal of travelling apparatus and composition, - - -	50
Sundries, - - - - - - -	150
	1,626
Annual saving per mile on the atmospheric system, - -	2,504
	4,130

Total expenses per ton per mile on the locomotive system, - -	1,54d.
" " " atmospheric " - -	0,06d.

Exclusive of carriages and management, which may be taken as the same on both systems.

MISCELLANEA.

There is a very interesting though somewhat discursive article on "Aqueducts and canals" in the London Quarterly Review, for March last. It will perhaps astonish the advocates of canals to learn that the Duke of Bridgewater regarded with no little uneasiness, and with almost incredible foresight, the ultimate capabilities of the railway, though at that time nothing beyond the common tramroad existed. When congratulated on at length reaping the profits of his perseverance and sacrifices, he replied "Yes, we shall do well enough if we can keep clear of those d—d tramroads."

The Croton aqueduct is also mentioned in these flattering terms: "Till London with all its water companies is as well supplied with accessible water as modern Rome is by only two of the aqueducts, whether fourteen, as some count them, or twenty, which ancient Rome possessed, we must content ourselves, Anglo-Saxons as we are, with resorting to New York for wise saw and modern instance, and must lead our readers to drink at the Croton aqueduct."

The reviewer has got it into his head that there is some doubt as to the work accomplishing its object. The only objections we have heard are that the deviations from the original plan in the Harlem bridge and dam in the Croton have cost the city several hundred thousand dollars, and that architectural effect appears to have been avoided not by an increase, but certainly without any diminution of expenditure. There having been no estimate of income, and the expenditure having been in fact "ad libitum," the Croton water works have escaped the searching and infallible ordeal through which the railway has to pass. But as regards the supply of water with reference to quality and quantity, there can be no doubt as to the excellence of the former, or the abundance of the latter.

The Mohawk and Hudson railroad company having done away with the use of the inclined plane at Schenectady, are now engaged in building an entire new road at Albany, in order to avoid the inclined plane at that city.

The Long Island railroad company are making a tunnel in Atlantic street, Brooklyn, in order to bring the engines near the ferry, and to do away with the use of horses. It will also save time, and thus aid them in competing for the Boston travel. Should this meet the eye of the engineers of the above important works, we would beg leave to intimate that some details as to the annual cost on the old plan, the saving by the new and the outlay by which

that saving is effected would be of interest to our readers generally, and, as we have in another part of this number endeavored to show, would be attended with no disadvantage to themselves.

The Central railroad (Michigan) will be opened in July to Marshall, and in the fall to Kalamazoo.

Enlargement of the Lachine Canal.—"In the list of imports by the Lachine canal in this day's Gazette, will be found the cargo of the Quebec forwarding company's barge Shannon, consisting of 1903 barrels of flour. This, we are informed, is the largest cargo ever brought from the upper country to this market, by about 400 barrels."—[Montreal paper.]

Here it will be seen that a wooden canal boat, which passes the old locks of this canal, has actually brought down 190 tons of freight. An iron boat would take 250 tons. Now we know that 100 boats per day can be passed through single locks with ease, and—we quote from memory—the total amount of western produce, via the St. Lawrence, does not exceed 600,000 to 700,000 barrels per annum; and 100 boats with 1900 barrels each, gives 190,000 barrels per day. Hence, the old Lachine canal will easily pass the western freight in 5 or 6 days, and would not require more than 10 or 12 days to pass all the flour and pork which passes over the Erie canal. Yet the former is to be enlarged from 20 × 100, (the size of the present locks,) to 45 × 200, and the channel of the canal in proportion. The "Canals of Canada" have, however, been thoroughly discussed in the Journal, and we only allude to them now to show that the views of the writer are fully borne out by experience, and also to give a practical and striking example of the ruinous consequences which infallibly result from entrusting to political adventurers the management of works, to the success of which that character and skill, which we have strongly insisted on in our opening article, so largely contribute, and without which all is a lottery.

RATES OF FARE AND RATES OF SPEED ON RAILROADS.

In our number for April we presented some considerations on this subject, and cited the case of the line of railroads between New York and Washington, as one on which rates of fare, much higher than could be judicious, were adopted. Our impression is that the prosperity of this route of travel has been much retarded by these rates, which have a tendency to throw off the travel on other routes, and at the same time to prevent the increase which at more reduced rates would take place between the cities which it connects. At the same time, it was evident to us, that the present rates of fare, if continued, must lead to rival lines being gotten up between these cities, of an inferior character perhaps, but at more reduced charges to the traveller, which would carry off much of the aliment pertaining to these works; and as friends of the railroad system, *reluctant to see it retrograde*, we were anxious to see a policy adopted, which, while it was liberal to the public, was *the true policy* for the railroad companies. At a rate of from \$2 to \$2 50 between New York and Philadelphia, the same between Philadelphia and Baltimore, and from \$1 to \$1 50, at farthest, between Baltimore

and Washington, and with not more than four and a half hours between New York and Philadelphia, and from five to five and a half between Philadelphia and Baltimore, the railroads connecting these towns may monopolize the whole travel between them, and that greatly increased, probably much more than doubled, by such a policy; but we predict if the present high rates of fare, and low rates of speed, on this great line are continued, a year will not elapse before rival lines of steamboats and stages will be established throughout its whole extent; and if established they will be sustained, both because at the present reduced prices of labor, provisions and materials, they will be kept up at a comparatively reduced cost, and because the public, which considers its good nature to have been abused by the railroad companies, will be inclined to support them. We trust that the railroad companies will look calmly at the subject, and see to what they are at present exposed by their too grasping policy, and mistaken views of it, and as we expressed ourselves in our previous number, on the subject, will "act on the principle of the ounce of prevention being worth the pound of cure."

It is apt to be the case that we are not apprehensive of danger where we have been for some time exposed to it, and the companies in question, having so far escaped any direct competition, may perhaps think themselves safe from it. But they should bear in mind that the country is no longer in the prostrate condition in which it has been since the revulsion of 1837, and that a spirit of enterprize is now abroad, which will leave unexplored no avenue to profit. Ericsson boats have been already built, and more are building, for the conveyance of freight and passengers between New York and Philadelphia, New York and Richmond, and Philadelphia and Richmond. These boats may be expected to divert some travel from the railroad lines, but nothing in comparison with what would be taken from them by lines of stages and steamboats at a reduced rate between New York and Philadelphia, and Ericsson steamboats between Philadelphia and Baltimore, by way of the Chesapeake and Delaware canal, or a line of very quick steamboats on the Delaware river, and Chesapeake bay, connected by an expeditious stage line between Newcastle and Frenchtown, or parallel to the Chesapeake and Delaware canal. An *independent* canal line, or a day line of quick, steamboats could not fail to do well at half the present rates of fare charged by the railroad company between Philadelphia and Baltimore.

We say an *independent* canal line, because there is at present a daily line of Ericsson boats between Philadelphia and Baltimore on the canal route, but these it is generally understood are owned by the railroad company, or large stockholders in it, and are now, *not* to make money by the transportation of passengers, but rather to keep travel *from* the canal, and throw it on the railroad, the rates with this view being kept nearly as high by the canal line as on the railroad itself. The fact that few travellers under these circumstances take the canal route, is no evidence that a really effective line on the canal would not carry off a very large travel. On the contrary we are very much mistaken, if a night line on this route would not compete even at

the same rate of fare very advantageously with the railroad; and, therefore, if once gotten up and prosperous, there would be no probability of the railroad company putting it down, or buying it up without a great sacrifice.

Instead of adopting a policy which will certainly bring about these results, we would earnestly urge the companies between this and Baltimore to look to the other side of the picture, and see what may be done by diminished rates of fare and increased speed. In the first place their example would be followed by other railroad companies south and west of them, and the whole of that travel which is now diverted to the sea, and passes between the north and south in sloops and schooners, or which passes up the Hudson, and thence around by the great lakes, even to New Orleans, would pass over their railroad and the Baltimore and Ohio railroad to Wheeling, or by the railroads south of Baltimore to the south and south-west. Secondly, the local travel between the large cities would be greatly increased. But, lastly, and what seems to us of much more moment than any other consideration, the companies would establish the prosperity of their works on a more permanent foundation, both by doing away with the temptation which now exists to competition, and by satisfying the public which is at present universally impressed with the opinion that the fares on the great routes in question are *too high*, and their rates of speed *too slow*, and that in other respects *it is not accommodated on them as it ought to be.*

Our thanks are due to the Hon. Asher Tyler, the Hon. Horace Wheaton and the Hon. Hamilton Fish, of the House of Representatives, for public documents—recently received.

ELIHU BURRITT expresses himself as follows in relation to the "iron horse" of the railroad: how few there are who can do it more eloquently. "I love," says he, "to see one of these huge creatures, with sinews of brass and muscles of iron, strut forth from his smoky stable, and, saluting the long train of cars with a dozen sonorous puffs from his iron nostrils, fall gently back into his harness. There he stands, champing and foaming upon the iron track, his great heart a furnace of glowing coals; his lymphatic blood is boiling in his veins; the strength of a thousand horses is nerving his sinews—he pants to be gone. He would 'snake' St. Peter's across the desert of Sahara, if he could be fairly hitched to it, but there is a little sober eyed, tobacco chewing man in the saddle, who holds him in with one finger, and can take away his breath in a moment, should he grow restive and vicious. I am always deeply interested in this man; for, begrimed as he may be with coal, diluted in oil and steam, I regard him as the genius of the whole machinery, as the physical mind of that huge steam horse."

Fitchburgh Railroad.—The cars on this road made their first appearance at Concord on Thursday, June 6th, and the trains will now run regularly; the track is progressing rapidly towards Vermont, and—Canada? *certainly.* Since the above, we have received a copy of their report, and shall refer to it in our next.

Railroad Accident—on the Syracuse and Auburn railroad, on Wednesday evening, 5th June, says the Rochester daily Advertiser, without other injury than what was sustained by the "iron horse." Would it have occurred if the cars had been moved on the "atmospheric" principle? *Mr. Samuda*, one of the inventors, says it is impossible.

Norwich and Worcester Railroad.—The Norwich Courier, of June 4th, says that the annual meeting of the stockholders of the Norwich and Worcester railroad took place in this city yesterday. The following gentlemen were elected directors for the ensuing year: D. Tyler, W. P. Green, J. A. Rockwell, Norwich; A. DeWitt, Oxford; W. W. Ward, Boston; S. R. Brooks, Jacob Little, Elihu Townsend, John Rankin, Alfred Brooks, New York; Asa W. H. Clapp, Portland, Me.

It is said that is in contemplation to extend the Long Island railroad seven miles beyond Greenport, bringing its terminus to within fourteen miles of New London. Another project on the tapis is to extend the Norwich and Worcester road down the river to a point opposite or below New London, so that the termini of the two roads shall be brought within 13 or 14 miles of each other. Thus this route between Boston and New York would be substantially a land route. If, then, the distance from New York to the eastern terminus of the Long Island road—one hundred and one miles—shall be accomplished in three hours—no more and no less—(and that is what the company confidently expect to do) this route will inevitably be the quickest, surest and most popular route between the two cities. As such, it is sure, also, to become the great mail route.

Boston and Worcester Railroad.—The stockholders, at their annual meeting on Monday, 3d June, says the Bay State Democrat, re-elected Messrs. Nathan Hale, David Henshaw, Daniel Denny Eliphalet Williams, George Morey and Nathaniel Hammond, directors—and chose Messrs. John Hathaway, Abraham T. Low and Benjamin F. White, in place of Messrs. Moses Williams, Addison Gilmore and Nathaniel F. Emmons, who declined a re-election. The annual report was submitted and ordered to be printed.

We have received a copy of the report—from some kind friend, who will please accept our thanks—but have not yet had time to examine it, will do so, however, in time for our next number.

Boston and Providence Railroad.—At the annual meeting of the stock holders of the Boston and Providence railroad, the old board of directors were re-elected. The receipts from January 1st, 1843, to January 1st, 1844, have been $98,821, against $75,620 in the same time of 1843—increase $23,201. The month of June is estimated at $26,000—last year, $23,749. The expenses have been materially less than in 1843, and the nett revenue for the past six months will be nearly equal to what it was when the whole New York business was done by this road. It was voted to subscribe $40,000 in aid of the Stoughton Branch railroad, which insures its being built, and will give a large addition of business to the Providence. The freight has increased this year 96 per cent. to way stations, and 11 per cent. to New York.—[N. Y. American.]

Greenfield and Northampton Railroad.—We learn, says the Greenfield (Mass.) Democrat, that Mr. Hoyt, is making good progress in the survey of this road. From a point a little this side of Northampton, for the distance of about 11 miles, the road can be made in a right line "as straight as an arrow," and perfectly level. The country is so level that the expense of grading that part of it cannot exceed one thousand dollars per mile. So favorable a location for a railroad can scarcely be found in "New England." The distance from Greenfield to Northampton, by the railroad, will be 18 1-2 miles.

Another Railway.—The Hartford papers recommend the construction of a railway from that city to Danbury, for the purpose of forming a direct railway communication from Boston and Hartford to New York; in opposition to the proposed railway from New Haven to Bridgeport. The distance from Hartford to New York via Danbury it is estimated can be performed in four hours. The highest gradients will not exceed 40 feet per mile, and the road will pass through Waterbury and several manufacturing villages.

At an election of directors of the Mohawk and Hudson railroad company, held on the 12th inst, the following persons were elected directors for the ensuing year: George Law, Jacob Little, Edward Mills, Wm. S. Hoyt and John B. Lasala, of New York; Rufus H. King, Augustus James, Herman Pumpelly and John V. L. Pruyn, of Albany. And at a meeting of the board held the same day, George Law was re-elected president and Jacob Little vice president.

CONTENTS: